CHAPTER VI: INTERMITTENT IMPROVEMENTS, 1841-1861

The constitutionality of waterways improvement projects, like many other important issues of the era, was not resolved during the two decades prior to the onset of the Civil War; and the issue was complicated by the growing sectionalism and political factionalism of the period. Southerners commonly, though not completely, opposed federal waterways projects as unconstitutional extensions of federal powers; Westerners, whose commerce was still transported chiefly by waterways, ordinarily supported federal improvement of inland river navigation; while Easterners often advocated the improvement of seacoast harbors, but gave less than wholehearted support to projects for the inland rivers. Republicans, Free Soilers, Northern Whigs generally advocated the improvement of navigation at federal expense, and Democrats and Southern Whigs were, for the most part, hostile. But sectional origins or political preferences were not always reliable indices to the position a congressman might take on a particular rivers and harbors bill. Local interest in a particular project often took precedence over general political principles.[1]

The political and sectional turmoil of the antebellum era made systematic project planning difficult, interrupted important works, and, in short, rendered ineffective the efforts of the Army Engineers to keep the inland rivers navigable. The Engineer program for the improvement of inland waterways became a sporadic affair, according to the political party in power, for federal waterways policies were altered by practically every new national administration from 1841 through 1861. About the only continuity the waterways improvement program had during the era was provided by Colonel John James Abert, Chief of Topographical Engineers from 1838 to 1861, and Colonel Stephen H. Long, who served intermittently as Superintendent of Western River Improvements from 1843 to 1856. It was a discouraging time for the Army Engineers on the Ohio and other inland rivers — a period of increased interest in railways and declining interest in waterways, of growing waterways commerce and spasmodic waterways appropriations. On the other hand, some promising new concepts in waterways engineering — slackwater projects, reservoir construction, flood control — were first studied in the Ohio Valley during the same era.

Improvement Renewal, 1842

River interests and merchants of Cincinnati met in convention in 1842 to urge upon Congress the necessity for further appropriations for the improvement of western rivers. The convention pointed out, in a petition to Congress, that 450 steamboats, with average cargo capacity of 200 tons, were plying the inland rivers and providing employment for more than fifteen thousand crew members. The petition claimed the work of Captain Shreve and Captain Sanders prior to 1840 had reduced losses due to snags on the inland rivers by three-fourths, declared the West had just as much need for the improvement of its navigable rivers as did the East for improved harbors, and concluded: "We are not aware of the causes which have induced the discontinuance of this valuable service, but we know that the consequences have been disastrous." From 1839 to 1842, one hundred thirty-eight steamboats went down on the inland rivers, with estimated financial losses of a

million dollars annually.[2]

President John Tyler, who became President at the death of William H. Harrison in 1841, though remembered as a strict-constructionist, states' rights advocate, did approve of a few waterways projects, evidently taking the position of Andrew Jackson that the improvement of major rivers was constitutionally unobjectionable. The importance of such rivers to the prosperity of the nation and the security of the country in time of war could not, in the opinion of President Tyler, be overlooked. On August 23, 1842, Congress provided funds for building and repairing snag-boats and for renewing navigation projects on the Missouri, Mississippi, Ohio, and Arkansas rivers. It was the first of three annual rivers and harbors appropriations.[3]

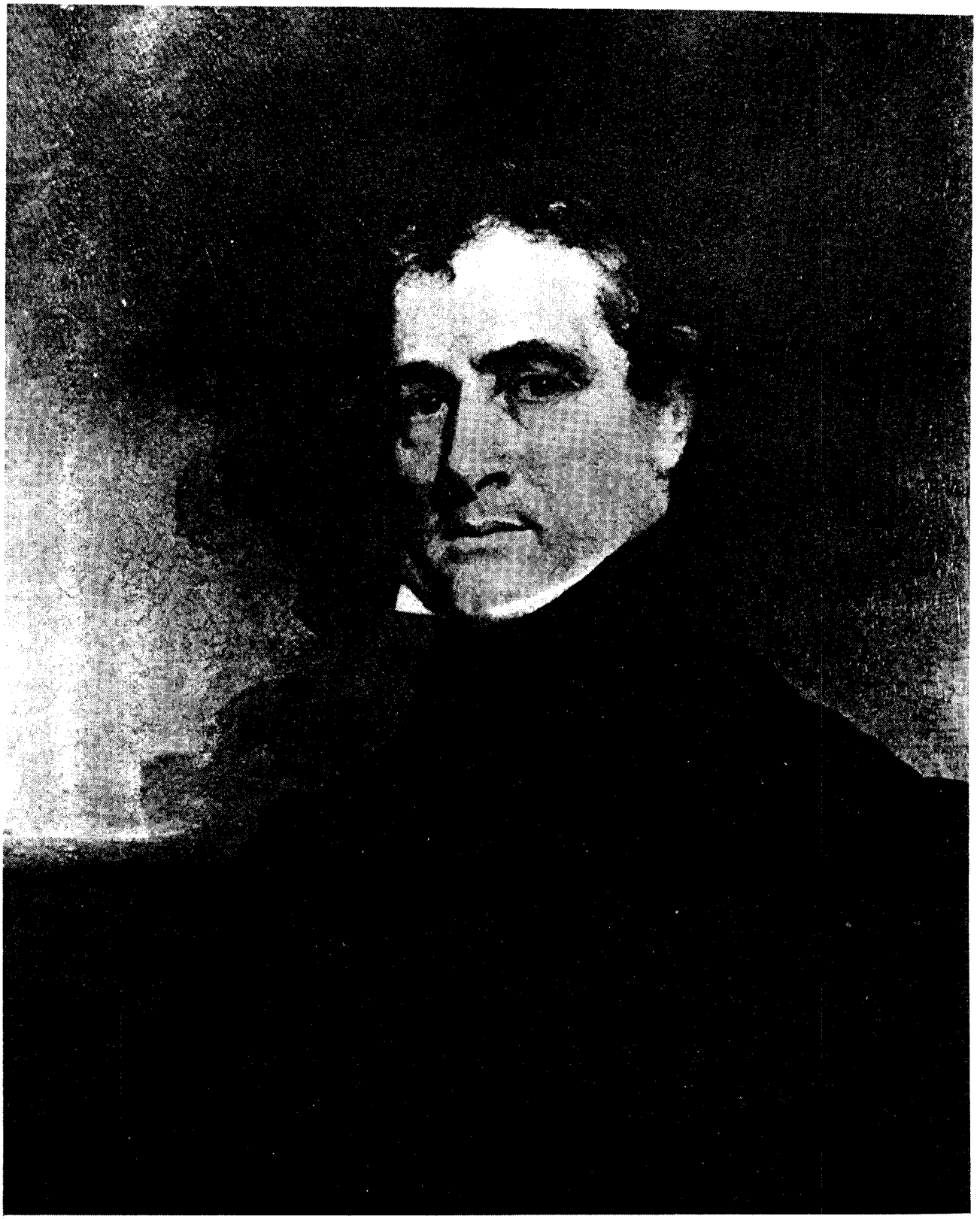
After Captain Shreve had been removed by the Tyler administration in 1841, work on the clearance of the Red River Raft had continued by contract with General Thomas T. Williamson, who purchased the snag-boat *Eradicator* for $8,000. The remaining Engineer fleet became the responsibility of Captain John W. Russell, an experienced steamboat captain and a devout Whig of Frankfort, Kentucky. By 1841 Captain Russell was a near-legendary figure on the western rivers. A Kentucky newspaper commented on his appointment:

> He has followed the river, if we are correctly informed, almost ever since the commencement of steamboat navigation in the West; and, without justifying the removal of Captain Shreve, we have no hesitation in expressing the opinion that Captain Russell is an excellent appointment. As to being obeyed, he can knock down six of the best men in his employment at any time.[4]

Russell was a physical giant who had developed great strength as a flatboat and keelboat navigator. As a steamboat engineer, he once, so it was reported, lifted a 1,647-pound shaft and carried anchors weighing 1,242 pounds across a steamboat deck. Though such claims sound apocryphal, the precise weights lend them some credibility. But Captain Russell achieved his greatest renown when he whipped Jean Lafitte, the pirate, in a brawl in New Orleans, and when he hooked his steamboat to a building at Natchez-Under-the-Hill and dragged it into the Mississippi, threatening to pull in the whole town unless money taken from one of his passengers was returned. (It was returned.)[5]

In 1842 Captain Russell was instructed by Colonel John James Abert, Chief of Topographical Engineers, to prepare the *Heliopolis* and the *Archimedes* for action. He arranged the repair of the two old snag-boats at the Paducah shipyards, and contracted for the construction of two additional "toothpullers," the *Samson* and *Sevier*, for $20,000 each at New Albany, Indiana. Initial operations were held up by an attempt of Captain Shreve to obtain an injunction against their use without compensation for his patent, but court action was dropped when Congress took up the subject.[6]

In the meantime, the Chief of Topographical Engineers ordered Captain George W. Hughes of the Corps to examine the Ohio and Mississippi and report on the condition of old projects. Hughes employed R. Philip Baker, a former assistant to Colonel Stephen H. Long, secured a skiff at Pittsburgh, and descended the rivers in late 1842. Hughes, who had studied European fluvial engineering extensively, and Baker, who had considerable practical experience on state navigation projects in Tennessee and Kentucky, produced a complex, authoritative report on the Ohio.



(Photo courtesy of Kentucky Historical Society)

CAPTAIN JOHN W. RUSSELL

Their studies indicated that a more radical improvement project for the Ohio might be advisable in the future, but, in view of limited funding, they recommended the renewal of the old river clearance and dike construction projects on the Ohio. Their report was delivered to the new Superintendent of Western River Improvements, Colonel Stephen H. Long, appointed on February 22, 1843.[7]

Activities of Colonel Long, 1843-1845

From 1826, when he completed the experimental wing dam on the Ohio, to 1843, Colonel Long had served as consulting engineer on a number of state projects, such as the project for the improvement of the Tennessee River in 1832, as assigned by the War Department. He engaged in planning and constructing several of the earliest railroads in the United States, and he developed an improved locomotive engine and designed new bridge construction methods. At the time he was reassigned to the improvement of western rivers, he was concluding surveys for railroads for the state of Georgia, during which he had founded "Terminus," which eventually became the city of Atlanta. Colonel Long left Georgia in April, 1843, traveled to Chattanooga, Tennessee, then down the Tennessee River to Paducah, where he joined the snag-boats *Heliopolis* and *Archimedes* on their way to Louisville. Colonel Long established the Office of Western River Improvements at Cincinnati, Ohio, on April 25, leaving the Lousiville office to Captain Russell who was directing snag-boat construction.[8]

Some conflict between Colonel Long and Captain Russell over their respective duties ensued, as might be expected from two such colorful personalities, but Russell was a definite asset in handling the rough rivermen of the era. Service on snag-boats was hazardous; many were seriously injured, or died in the service, while others suffered the ravages of cholera, typhus, influenza, and malaria. In 1843, one crewman of the *Samson* walked off the end of the boat and another was dragged into the river while playing out the windlass, and both drowned. The Chief of Topographical Engineers recommended in 1844 that snag-boat officers and men "employed on duties as exposed, as harardous, and often as fatal, as the vicissitudes of a campaign, should . . . like the wounded and disabled soldier, receive a pension proportioned to the injury he has received."[9]

Colonel Long once reported the "want of due subordination on the part of the crews of all boats;" and, revealing his ascerbic views of human nature, recommended severe penalties for infractions aboard ship. He said:

> The propriety of substituting rewards instead of penalties, for the purpose of promoting correct discipline, industry and good behavior . . . is . . . questionable & would probably tend to the subversion of orders and good fellowship on board; for however worthless and inefficient any individual may prove to be, he is generally unwilling to admit, that his services are not equally as valuable & praiseworthy as those of the most industrious . . . ; which the awarding of a compensation to one, greater than that allowed to another, would be likely to engender dissatisfaction, animosities & strife on board . . . .[10]

The *Heliopolis* and *Archimedes* were worn out by 1845, and Colonel Long sold them. The large twin snag-boat *Hercules* and the light snag-boats *Gopher* and *Dragon* replaced them. The two last-named vessels, designed by Captain John Russell and snag-boat captains John K. Dillingham and Abraham Tyson, were improved versions of the Shreve vessels. Each had a strongly fortified and double-planked single hull, with a "bow transom"

replacing the snag-beam of the Shreve boats. Captain Tyson substituted vertical derricks suspending powerful tackle, mounted on the bow transom, for the wheel and windlass used on the old twin-boats. Instead of ramming snags loose, then pulling them up with the windlass between the hulls, the new boats hooked to snags with the tackle hanging from the derricks and powered by the main water wheel shaft, and forced snags from the bottom by a simultaneous butting and dragging action. The *Gopher* and *Dragon* drew less than thirty-inches of water, were faster than the older boats, were more economical in operation, and were expressly designed for service on the shallow reaches of the upper rivers. Through the use of these vessels and other measures, Colonel Long reduced the cost of removing snags from $13 per snag, which had been the average cost before 1838, to $6.54 in 1845.[11]

The Return of Captain John Sanders, 1843-1845

Colonel Abert also dispatched Captain Campbell Graham of the Corps to Pittsburgh in late 1842 to renew the Upper Ohio River project. Captain Graham began an inspection of the condition of the dikes constructed during previous operations, but an effort was made in Congress to secure the appointment of a civilian as superintendent of the project. A petition to Congress signed by many steamboat captains, shippers, and manufacturers thwarted this effort by requesting the return of Captain John Sanders, Corps of Engineers, to the Upper Ohio. Col. Abert of the Topographical Engineers requested Colonel Joseph G. Totten, Chief of the Corps of Engineers, to loan the services of Captain Sanders for the project, because the "valuable experience acquired by this officer, in his former direction of the same duty, and the known public desire that the work should be pressed forward with much activity renders it a matter of public interest that his services should be obtained." Colonel Totten complied with the request, and Captain Sanders arrived at Pittsburgh in early April, 1843.[12]

Colonel Long was designated inspecting officer of the Upper Ohio project for the Topographical Bureau, and he examined Captain Sanders' renewed operations in May, 1843. The Colonel reported that the Upper Ohio project consisted of:

> The construction of wing dams, jettees, &c., having for their object the concentration of the entire low-water volume into a single channel of moderate width, together with the reduction and removal of all bars, rocks, logs, &c., in the way of such a channel, seems to embrace and constitute the only feasible and economical means of improvement that can been applied in this river with a fair prospect of beneficial results.[13]

Chiefly because the improvement of the Ohio River above Louisville became the responsibility of Captain Sanders, Colonel Long was ordered to move the Office of Western River Improvement from Cincinnati to Louisville on April 25, 1844. In early May he arrived at Louisville and occupied an office on Magazine Street between 7th and 8th streets.[14]

Captain Sanders employed two assistant civil engineers, Allan Campbell and Charles A. Fuller, to direct the construction of proposed dikes at some seventy islands and shoals on the Upper Ohio, and entered into several contracts for the work. Because the effectiveness of dikes was limited, Captain Sanders spent a great deal of his time developing methods for deepening and widening channels. He divided the Upper Ohio into five sections, each about a hundred miles in length, and assigned a small floating plant and work

force to each section. At high water stages the section gangs cut potential snags from banks and islands, and at low water they removed snags and blasted channels through rocky shoals. Blasting methods were still much like those used on the Louisville and Portland Canal in the 1820s. The men stood in the water to drill holes with hand tools, inserted tin powder-filled canisters in the holes, tamped in clay, and detonated the charges. During the 1843 working season, a work force at Beaver Shoals made 666 blasts, consuming 17 kegs of powder and 1600 feet of fuse in the process, and removed an aggregate of 250 cubic yards of solid rock from the channel. Similar work was accomplished at a number of other shoals on the Upper Ohio.[15]

The First Ohio River Dredge

Captain Sanders also initiated a search for mechanical methods of removing compacted sand and gravel formations. The heavy dredges then in use at seacoast harbors were not suitable for the shallower inland rivers, and horse-drawn scrapers were useful only for short periods, when the Ohio was at extreme low-water levels. Contractors on the state project for improving navigation on the Kanawha River had developed a method of scraping bars with horse power. They set two flatboats in place, with piles, on each side of a bar and placed two long parallel timber beams between them. On one boat they installed a capstan that was attached by chains to a scraper between the parallel beams. As horses turned the capstan and wound the chain, the scraper, guided by men walking the beams, was drawn across the bar to loosen and remove the top layer. Repeated use could open a navigable channel across the bar.[16]

But the machine was not usable on the Ohio River, because it would obstruct the constantly passing traffic. Mr. W. Henry McCarty, a "very ingenious man" employed by Captain Sanders, devised a steam-powered scraper somewhat similar to the machine used on the Kanawha. A steam engine, mounted on a boat anchored upstream of the bar to be improved, turned a capstan and pulled a scraper attached to a small boat across the bar. At a cost of $1500, Captain Sanders constructed the McCarty scraper — the first crude dredge used by the Army Engineers on the Ohio River — and placed it in operation on August 1, 1843. Sanders reported the machine produced the "most beneficial results." In a single day it excavated fifty cubic yards of compacted gravel! And transported it a distance of one hundred feet. Several similar machines were subsequently constructed and placed into operation on the Upper Ohio.[17]

Polk Stalks

The Democratic administration of James K. Polk took office in 1845, and President Polk, who contended that federal waterways projects were unconstitutional, vetoed every waterways improvement appropriation enacted by Congress. It was reported that on the eve of the end of his term he went to his office with prepared vetoes in his pocket for any improvement bills which Congress might enact. In 1846, after he vetoed a one and a half million dollar appropriation for waterways, the Cincinnati *Gazette* commented that every snagged boat, every grounded boat, every lost cargo, and each life lost in a steamboat accident would be memorials to James K. Polk. And rivermen began to refer to snags as "Polk stalks."[18]

Colonel J. J. Abert, Topographical En-

gineer Chief, continued to publicly advocate federal improvements to navigation, and as a result became very unpopular with the Polk administration. In 1845, Colonel Abert sought to explain the intimate connection between civil works and national defense preparedness:

> It is a country that is to be benefited, not a county — a nation that has to be aided, not a town. And all these, by increased facilities of intercourse, by concentrating population, by encouraging agriculture and manufactures, add to national resources, civil and military; give strength, give confidence, give numbers, give wealth, give arms and implements of war, and means of making them; increase national unity, national strength, and add to all elements of national defense.[19]

Termination of Waterways Projects, 1845

Captain John Russell, the Whig appointee as agent in charge of snag-boats, was removed from office by the Polk administration on May 31, 1845. His removal was probably in order, for he had actively campaigned for Whig candidates. Captain John Sanders delivered the Engineer fleet and equipment of the Upper Ohio project to Colonel Long at Louisville and departed for Texas to join the army of General Zachary Taylor. One of his assistants, Charles A. Fuller, was employed by Colonel Long, and the other, Allan Campbell, resigned. Colonel Long suspended active projects, sold some of the Engineer fleet, and tied up the remainder for preservation. Some of his assistants and his son, Henry Clay Long, resigned to join the Louisville Legion of the volunteer Kentucky militia, bound for Mexico; and Colonel Long turned his personal attention to the logistical problems of the war.[20]

The Waterways and the Mexican War, 1846-1848

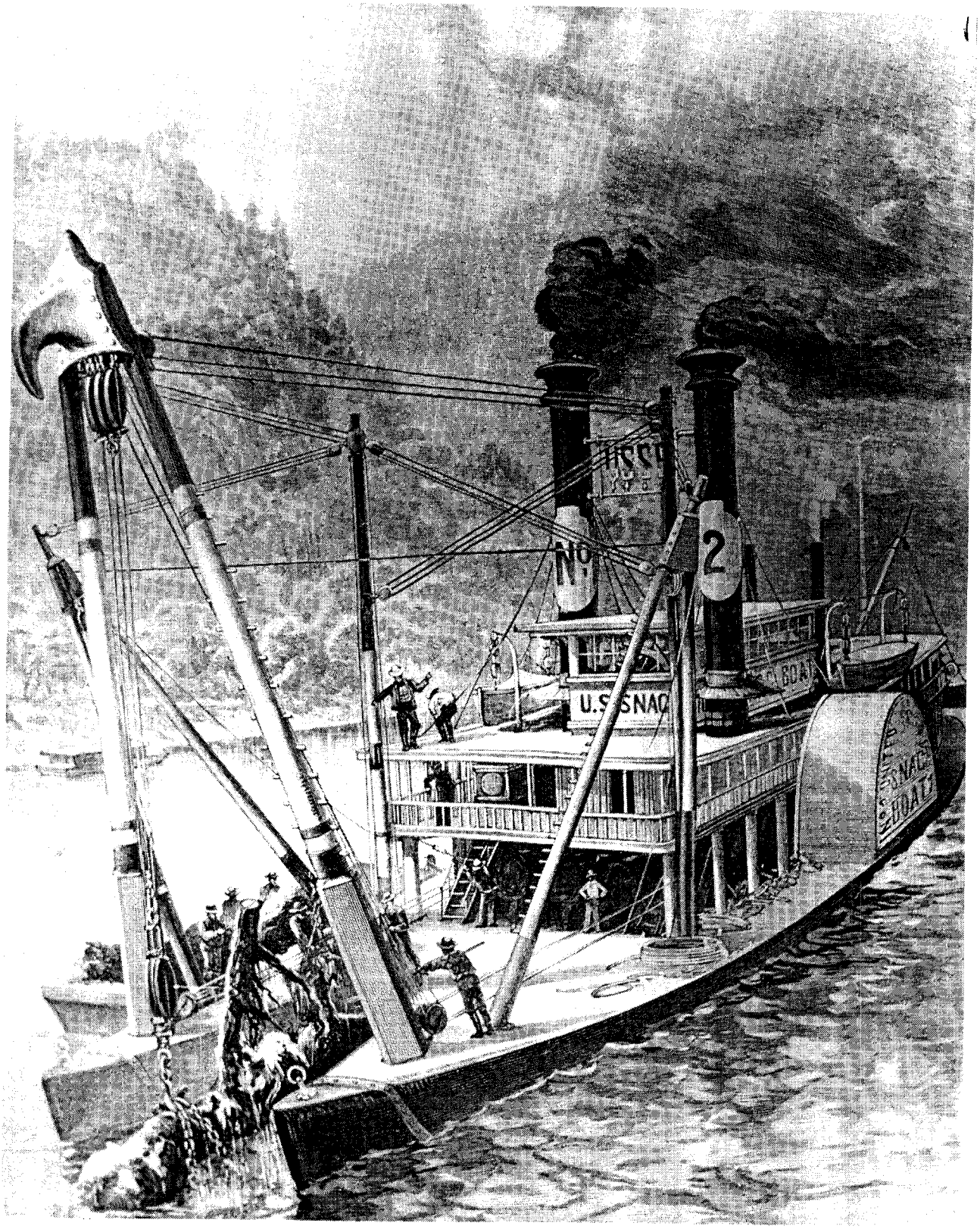
Captain John Sanders had approached Congressman Richard Hawes of Kentucky and others in 1838 about premobilization contingency planning for the utilization of the watercraft and military resources of the Ohio Valley in case of war along the Gulf Coast, or nearby frontiers. And in 1843 he submitted a report to Congress, recommending the construction of a "fresh water flotilla," a fleet of ironclad steamboats and transports, which could be sent to New Orleans on short notice in a national emergency. He declared that:

> The steamboats on all the waters emptying into the Gulf of Mexico, are chiefly built above the falls of the Ohio. In a military point of view, the patriotic statesmen of our republic could have no nobler object than to discover the means of turning, on a sudden emergency, the ordinary industrial pursuits of the country into a war channel. If workshops and ship yards are in the interior of the country, vast expense is saved in preparations for their defence.[21]

Congress took no action on his recommendations, but during the war with Mexico Captain Sanders and Colonel Long were given an opportunity to partially implement such a plan.

General Zachary Taylor ordered Captain Sanders to arrange the supply of the army advancing into Mexico, utilizing steamboat navigation on the Rio Grande. Captain Sanders returned to the Ohio Valley and procured fourteen supply and troop transport steamboats, then returned with them to the Rio Grande and established regular steamboat navigation up the Rio to the supply bases nearest the army. He afterwards rejoined the army outside Monterey, Mexico, and led the combat engineers who cut a passage, literally through the walls and roofs of buildings, for the assault troops who took the city.[22]

During the course of the war, the Ohio and Mississippi waterways served as the



U. S. Snagboat No. 2, 1889. Single-hull, double-bow design similar to those constructed by Col. Long at Louisville in 1840s and 1850s. From Harper's Weekly, November 2, 1889.

principal logistic lines for the armies in Mexico. Troops, subsistence supplies, and cavalry mounts moved in a steady stream via the western steamboat down the rivers to New Orleans from port cities and military posts along the Ohio and Upper Mississippi rivers. In September, 1846, Colonel Long transferred the snag-boats *Golpher* and *Dragon* to the Quartermaster Department for use as transports and for clearing the rivers in Texas of snags. In October he received the mission of constructing additional steamboat transports and a steam dredge for the Quartermaster Department for service on the Rio Grande. The steam dredge *Lavaca*, a ladder dredge capable of moving 150 cubic yards of material per hour, was delivered to the Quartermaster Department in 1847. During 1847 and early 1848, Colonel Long arranged the contract construction of six steam vessels for military service. Two, the *General Jessup*, 374 tons, and the *Colonel Hunt*, 200 tons, were built at Louisville for service on the Rio Grande. The other four, built at Louisville and Cincinnati and named the *General Hamer*, *Ann Chase*, *General Butler*, and *Colonel Clay*, were side-wheelers designed for service in the Gulf of Mexico.[23]

Activities of the Louisville Office, 1849-1852

At the end of the Mexican War, Colonel J. J. Abert modestly summarized its effects on the Engineers: "The peace with Mexico returned to the United States the large proportion of the officers of the corps which had been employed with the army in that country. The greater part of those were maimed with wounds, or sick from the fatigues and exposures which their duties required. Of their services in Mexico it is not necessary that I should speak."[24]

In 1849 Colonel Long still directed the Office of Western River Improvements at Louisville, but its civil works activities were minimal until 1852. The snag-boats *Samson* and *Sevier* were dismantled at Paducah, and their engines stored aboard the remaining snag-boat, the *Hercules*. C. A. Fuller, Assistant Engineer, was studying the old Cumberland Dam project and planning its repair and modification. Joshua Barney, Assistant Engineer, was conducting yet another survey of the proposed canal on the Indiana bank of the Falls of Ohio.[25]

Some excitement was created at the Office when young Lieutenant James W. Abert, son of Colonel J. J. Abert, Chief of Topographical Engineers, reported to Louisville as an assistant to Colonel Long. Lieutenant Abert often commenced his official reports to the Chief with the greeting: "My dear father." After arriving at Louisville and finding Colonel Long absent on official business, the Lieutenant had taken an excursion to Cincinnati. When Colonel Long returned to the office he asked the Lieutenant to explain his reason for leaving his post. Abert responded that since his superior was absent, he had become senior officer at the post and had granted himself a leave of absence. Colonel Long had planned to assign Lieutenant Abert to a survey of the Falls of Ohio, but instead wrote the Chief Engineer that, "having nothing special to occupy the attention of Lieut. Abert . . . I see no objection to his being relieved from duty at this station . . . ." But Lieutenant Abert eventually adjusted to his duties at Louisville, found them to his liking, married a Louisville belle, and made Louisville his home.[26]

The principal mission of the Office of Western River Improvements from 1849 to 1852 was the planning and construction

of marine hospitals for western rivermen — a duty assigned to the Office by the Treasury Department. Colonel Long was directed to build hospitals at Louisville and Paducah on the Ohio and at Natchez and Napoleon, Arkansas, on the Mississippi. He disapproved of the Napoleon site because of caving river banks and recommended, instead, a site at Helena, Arkansas. But the Treasury Department ordered construction to proceed and the four hospitals were completed in the 1850s. The one at Napoleon, followed by the entire town, fell into the Mississippi in 1868.[27]

A Third Beginning, 1852-1853

By 1850 disgruntled western rivermen were vehemently protesting the failure of Congress to appropriate for inland rivers. A river convention met at Evansville, Indiana, in 1850 to petition for appropriations. Its petition claimed that obstructions in the rivers annually produced more losses than all funds previously expended on waterways improvements and caused a greater loss to the West in 1850 than the "whole amount of money expended by the government in keeping up its army or its navy." Though the Whig ticket, Zachary Taylor and Millard Fillmore, which won the election of 1848, approved federal improvement of waterways, Congress had not acted. After succeeding to the presidency on the death of General Taylor in 1850, Millard Fillmore plainly stated his position on federal civil works: "I entertain no doubt of the authority of Congress to make appropriations for leading objects in that class of public works comprising what are usually called works of internal improvement."[28]

Congress finally voted a major rivers and harbors law in the last year of the Fillmore administration. The Rivers and Harbors Act of 1852 provided $150,000 for rebuilding the snag-boat fleet and for its operations and a separate appropriation for dike repair and construction on the Ohio, plus funds for many other projects. The old team of Colonel Long, as Superintendent of Western River Improvements, Charles A. Fuller, as Superintendent of Ohio River Improvements, and Captain John W. Russell, who had been restored to the snag-boat command by the Whig administration in 1852, went back to work, operating out of a four-room office at Louisville. One room was the Colonel's office, another was occupied by Fuller, two clerks occupied the third office, and the fourth served as a drafting and map-preparation room. Captain Russell worked at the New Albany shipyards, where he constructed a steam dredge, the *Gopher,* and a small snag-boat, the *Terror,* for the Ohio River project, and another steam dredge and five light snag-boats (numbered 1-5) for use on other rivers. The *Terror,* commanded by Captain John K. Dillingham, operated chiefly above the Falls of the Ohio; and the dredge *Gopher* did most of its work at the Cumberland Dam project.[29]

Pierce Punctures the Project

The renewed operatons under the appropriations of 1852 were short-lived, for at the end of the year the Democratic candidate, Franklin Pierce, was elected President, and he chose Jefferson Davis (later President of the Confederate government) as his Secretary of War. President Pierce vetoed bill after bill which would have continued waterways projects. Congress enacted five waterways bills over his veto in 1856, but none provided funds for the Ohio River. Secretary of War Davis completely agreed with the

President's position, and recommended that any necessary waterways project be carried out by the states and financed by the states or by the imposition of tonnage duties.[30]

Captain Russell foresaw what would be his fate. He had been elected by the voters of Franklin and Shelby counties to the Kentucky State Senate, but he sought to retain his position with the Engineers by acquiring the indorsements of forty-six members of Congress, including a few "influential Democrats" of Louisville, and sending them to the Secretary of War. But his services were terminated in August, 1853. Colonel Long kept Russell on the job for a time settle the snag-boat accounts; but when Secretary Davis learned of this action he accused Colonel Long of attempting to protect Captain Russell from dismissal for political reasons and informed the Colonel: "I have determined to relieve you from the Superintendency of the Western Rivers and assign in your place Brevet Lieut. Col. J. E. Johnston." Colonel Long requested a court of inquiry, but the Secretary refused, stating that changes of station ordered by the War Department were not subject to such investigation. On November 1, 1853, Colonel Joseph E. Johnston (later a Confederate General) took charge of the Office of Western River Improvements, and Colonel Long departed for Washington to serve on the Board of Engineers for Lake Harbors and Western Rivers.[31]

New Concepts in Waterways Engineering

As the Engineer program for the improvement of the Ohio and other inland rivers wrecked on the rocks of political principles and political factionalism, a number of able civil engineers were engaged in studies of the applicability of improvement methods, other than snag clearance, channel rectification, and dike construction, to the Ohio. In publicizing results of their studies they launched an engineering controversy which was to continue until 1875 and even into the twentieth century.

The controversy was initiated by Colonel Charles Ellet, Jr., a brilliant young civil engineer who constructed the famed suspension bridge over the Ohio at Wheeling, (West) Virginia. During planning and construction of the bridge, he kept accurate records of river flow at Wheeling for a decade. After study of the records, Ellet calculated the average flow and concluded that a six-foot minimum navigable depth on the Ohio could be maintained by the construction of reservoirs on tributaries to retain flood waters and release them during low-water seasons. Ellet published the results of his hydrographic studies in 1849, acquired a copy of the Sanders map of the Upper Ohio, and proposed that Congress appropriate $20,000 for surveys of potential reservoir sites. Ellet was so enthused by his idea that he named his son Charles *Rivers* Ellet; he expected to be appointed as engineer in charge of the surveys.[32]

A Senate committee recommended that the proposed surveys be funded. Senator Henry Clay of Kentucky was also enthusiastic about the concept; he wrote: "The conviction is strong upon me that this project will ultimately prevail. I think we adopt what nature points out to us by constructing reservoirs to supply a deficiency of water in the channel at certain seasons of the year." And a number of prominent civil engineers, notably Colonel Elwood Morris, were also convinced that Ellet's idea had merit. But the Ellet reservoir system was too advanced

for the limited engineering capabilities of its time. Though reservoirs had been constructed in Europe and the United States, chiefly as feeders for canal systems and for municipal water supply, those Ellet proposed would have required larger dams than ever before constructed, and, like his bridge at Wheeling which fell into the Ohio in 1854, his hydrologic studies had certain flaws.[33]

Just as Congress prepared to authorize preliminary studies of reservoir sites in 1857, William Milnor Roberts, a distinguished civil engineer who had studied engineering under Canvass White on the Erie Canal and under Sylvester Welch, Kentucky state engineer, published a critique of Ellet's proposed reservoir system, claiming that costs would be much higher than Ellet anticipated, that land acquisition costs would be prohibitive, that the amount of water storage necessary to aid navigation was underestimated, and that low-flow augmentation and flood control were incompatible project purposes. Milnor Roberts was chief engineer of the slackwater lock and dam, or canalization (i.e., to make like a canal) project completed on the Monongahela River by a private corporation. He pointed out that similarly successful canalization projects had been completed by state governments on the Muskingum, Kentucky, and Green rivers in the Ohio Valley, and recommended the construction of a slackwater canalization project on the Ohio River.[34]

Roberts also found support in the engineering profession, notably from Josiah Copley of Pittsburgh, who advocated the construction of fifty locks and dams on the Ohio by a private corporation, and Alonzo Livermore, chief engineer of the Green and Barren River slackwater project. Livermore suggested that Roberts' plan be modified by installing movable chutes in the dams for navigation. Congress, however, was not receptive to a slackwater project. A Senate committee observed that the construction of fifty locks and dams along the course of the Ohio would cost immense sums for both construction and operations, would most likely be swept away by rampant Ohio River floods or be silted up, and concluded that the proposed canalization project would constitute "a very violent interference with the natural laws of navigation."[35]

Growing discontent with federal inaction led in 1855 to a third proposal for improvement of Ohio River navigation; this from private interests who supported the plans of Herman Haupt of Philadelphia (later Union General in charge of Military Railway construction). Haupt organized a company, chartered by Pennsylvania in 1855, which proposed to construct a two-hundred-foot wide canal down one side of the river, with cross dams and auxiliary reservoirs to furnish the water supply. A Senate committee reported unfavorably on the Haupt plan, commenting that:

> The Ohio is a national highway, and no single State can claim jurisdiction over it, or pretend to the right to disturb the flow of its waters, to regulate the transportation or tax the commerce that floats on its surface.[36]

Enlargement of the Louisville Canal

Other improvement methods were also considered at the Falls of the Ohio during the two decades preceding the Civil War; and Congress authorized studies of the comparative advantages of proposed improvements on several occasions. But Congress also refused to provide funds for any improvement, and the canal corporation finally proceeded with the en-

largement of facilities on its own. Western rivermen continually complained of Congressional neglect of the Falls, and some members of Congress agreed; at least, a House committee reported in 1846:

> We keep a fleet in the Mediterranean for the benefit of our commerce in that sea, and we were at great expense to negotiate with the Porte our passage through the Dardanelles; we maintain a fleet in the Pacific to promote our fishing interests in that quarter; we have about forty light houses to illuminate the coast within forty miles around Cape Cod . . . yet have done substantially nothing to give freedom to the navigation of the Ohio falls, which are in the geographical centre of our territory, and are passed by a commerce almost as great as we carry on with all the world.[37]

A survey of the "best mode" of improving navigation at the Falls was authorized in 1843; and it was completed by Captain Thomas Cram, Topographical Engineers, and Assistant Engineers Allan Campbell and Henry Clay Long (son of Colonel Long) in 1844. The Engineers recommended that the United States purchase the canal, enlarge it, and construct a second canal on the Indiana bank to establish two-way traffic. At the same time, a number of prominent civil engineers, including R. Philip Baker, Kentucky state engineer, and Joshua Barney of Ohio, were advocating the construction of a dam and lock across the Ohio below the Falls to submerge them. The proposal of the Army Engineers was not approved by Congress, and the suggestion of the civil engineers became the butt of much humor. Haldeman's *Directory of Louisville* for 1844 said:

> The plan of damming the Ohio river at the Falls, could only find advocates, one would suppose, in the realms of Laputa . . . . Slackwater navigation, it is argued may thereby be had, as far up as the mouth of the Kentucky River. Indeed! And suppose we were to raise the dam across the river at the Falls, a foot, or more, higher; why then, of course, we should have slack water navigation a few miles above the mouth of the Kentucky river!
>
> Again, it has been laboriously argued . . . that at some future day, (and long may it be future,) a dam and tunnel will be constructed across the Falls. For all such bold projectors, we earnestly pray that asylums may be assigned, before the small job of damming the Ohio at the Falls, is put up to the highest bidder.[38]

Cincinnatians, led by Salmon P. Chase, met in 1851 to protest continued federal procastination at the Falls and the obnoxious high tolls at the Louisville canal. Congress, evidently in response to complaints, provided$5,000 in the Rivers and Harbors Act of 1852 for another survey; and a Board of Engineers, consisting of Colonel Stephen H. Long, Colonel William Turnbull, and Mr. Charles B. Fisk, conducted the examination in early 1853. The Board proposed that a canal be constructed by the United States on the Indiana bank, but Congress again deferred action.[39]

In 1857 the Louisville and Portland Canal Company paid for another survey by Colonel Long, who proposed the construction of a larger lock with dimensions adequate for the largest Ohio River steamboat. Armed with the recommendation, the canal company obtained the permission of Congress, on May 4, 1860, to borrow the funds necessary to construct a larger canal and additional, larger locks, provided the company did not pledge the credit of the United States for the redemption of the bonds. And in that year the canal company initiated the construction of an enlarged canal at the Falls, but work was soon interrupted by the economic disruptions of civil war.[40]

The End of an Era

On March 28, 1855, Colonel Long re-

turned to Louisville and relieved Colonel Joseph Johnston as Superintendent of Western River Improvements, but he did not hold the post long, for it was abolished on December 11, 1856. In their last year of operation, 1854, the snagboats removed some 56,000 obstructions from western rivers; but snag removal was necessary after every high water, and in 1855 eighty-five steamboats went down on the Mississippi River system (twenty on the Ohio). Steamboat commerce increased during the 1850s despite growing railroad competition, lengthy nonnavigable water stages, and unimproved rivers; in 1855 seventy-six steamboats called Louisville their home port and 2,427 steamboats landed at the Falls City. As commerce increased on the obstruction-littered inland rivers, so did the number of accidents. From 1853 to the onset of the Civil War about three thousand Americans lost their lives or were injured in accidents on the western rivers.[41]

As he departed Louisville in 1856 for work at the mouth of the Mississippi River, Colonel Long took the opportunity to lecture Congress on its waterways policies and urge a change:

> With respect to the adoption of a system of annual appropriations for the prosecution of western river improvements, I conceive there can be no doubt of its propriety and economy. On at least three different occasions, liberal appropriations have been made by Congress for this service, covering the cost of the various kinds of craft, &c., required for the service, and the working of the same for a period limited by the balances remaining for the prosecution of the work after deducting the cost of the craft. In each of the instances alluded to the balance in question was sufficient merely to keep the craft employed . . . two or three years only; after the expiration of which the craft . . . has been sacrificed at public sale . . . . In this way nearly one-half of the prime cost of the boats . . . has been virtually wasted. It is believed that the sacrifices thus incurred may be avoided by adopting the system of appropriation herein suggested . . . .[42]

Work on the Ohio River, however, did not quite end when Colonel Long left Louisville. The Office of Western River Improvements had a balance on hand, after all vouchers were paid, of $1,148.11. In 1857, two Falls pilots, J. R. Hamilton and Jesse Vansickle, removed the wreck of a steamboat from the Falls and blasted rock from Indiana Chute. With a letter from Colonel Long testifying that their work had materially benefited navigation at the Falls, they applied to the Secretary of War for the unexpended sum in the river improvement account, and it was awarded to them.[43]

Then, in 1858, Captain James W. Abert returned to Louisville from a military assignment in Kansas Territory. He was ordered to assume charge of operations at Louisville previously under Colonel Long. Unfortunately, the remnants of the Engineer fleet were at work on the Red River Raft under Charles A. Fuller, or under Colonel Long at the mouth of the Mississippi, and no records or equipment of the Office of Western River Improvement remained at Louisville. At the end of fiscal year 1859, Captain Abert reported his operations for the year: "There has nothing transpired worthy of special notice during the past year. This Congress did not appropriate any money to carry on such works as fall under my supervision."[44]

The Secretary of War requested the Chief of Topographical Engineers to explain the nature of Captain Abert's duties, and Colonel J. J. Abert had to admit his son's duties were "very limited." The War Department ordered the Office of Western River Improvement reclosed on February 2, 1860; and Captain Abert was ordered to

Europe to examine the militia system of Switzerland.[45]

Summary

The two decades preceding the Civil War were discouraging years for the proponents of waterways navigation. Steadily increasing railroad competition and extended low-water seasons during the 1850s worried rivermen, and the political complications which prevented effective federal improvements of navigation increased this concern. Each time Colonel Stephen H. Long and the Office of Western River Improvements got projects underway a change in national waterways policies forced suspension of the work and destroyed the integrity of what should have been on-going projects. Because of the increasing amount of traffic and the larger size of the vessels, it even appeared that the navigability of the Ohio and other inland rivers was deteriorating.

On the positive side, the era was marked by developing interest in improving the navigation of the Ohio by more advanced engineering methods — a slackwater, canalization project and reservoir construction. Both methods were eventually to be implemented in the Ohio Valley and elsewhere by the Army Engineers — a canalization project for navigation and reservoir construction chiefly for flood control. And, at the end of the era, the long-awaited enlargement of the Louisville and Portland Canal was commenced. But for Colonel Long and the Army Engineers on the inland rivers the antebellum decades were, in essence, an era of frustration, when their best efforts were negated by national politics. Only after a number of political and constitutional issues were settled could effective improvement of navigation be initiated by the Army Engineers. And those issues were to be settled by the Minié ball and bayonet.